

We claim

1. A lattice point determining method for correspondence definition data creation, whereby a plurality of lattice points which are referred to when correspondence definition data which defines correspondence between the ink quantities of inks in more than 3, CMY, colors used in a printing device and the color component values of various colors used in another image device is created are determined, the method comprising:

a step of defining both an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points whose components are said ink quantities of inks in various colors and a CMY lattice point smoothness evaluation function for evaluating the smoothness of the disposition of CMY lattice points defined by CMY color components; and

a step of taking both CMY lattice points and ink quantity lattice points wherein said ink quantity lattice point smoothness evaluation function and said CMY lattice point smoothness evaluation function are separately substantially minimized, as lattice points for correspondence definition data creation.

2. The lattice point determining method for correspondence definition data creation, whereby a plurality of lattice points which are referred to when correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component

values of various colors used in another image device is created are determined, the method comprising:

a step of defining both an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points in an ink quantity space whose components are said ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space defined by a smaller number of color components than the number of these inks;

a step of separately optimizing the ink quantity lattice points and the lower-dimensional color lattice points by separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function; and

a step of determining a plurality of said lattice points by keeping either of the ink quantity lattice points and the lower-dimensional color lattice points at the optimized lattice points and readjusting the other optimized lattice points.

3. The lattice point determining method for correspondence definition data creation, according to Claim 2, wherein:

either or both of the ink quantity lattice point smoothness evaluation function and the lower-dimensional color lattice point smoothness evaluation function contain a function whose value is increased with increase in the difference between the

relative positional relation between a lattice point of interest and a lattice point adjacent thereto and the relative positional relation between a comparative lattice point adjacent to said lattice point of interest and a lattice point adjacent thereto.

4. The lattice point determining method for correspondence definition data creation, according to Claim 3, wherein:

the difference in said relative positional relation contains a function which contains as a component a value obtained by dividing the differential vector between a vector connecting said lattice point of interest and a lattice point adjacent thereto and a vector connecting a comparative lattice point adjacent to said lattice point of interest and a lattice point adjacent thereto by the distance between said lattice point of interest and said comparative lattice point.

5. The lattice point determining method for correspondence definition data creation, according to Claim 2, wherein:

either or both of said ink quantity lattice point smoothness evaluation function and the lower-dimensional color lattice point smoothness evaluation function contain a function whose value is increased as a lattice point of interest gets away from a specific position.

6. The lattice point determining method for correspondence definition data creation, according to Claim 2, wherein:

either or both of said ink quantity lattice point smoothness

evaluation function and said lower-dimensional color lattice point smoothness evaluation function contain a function whose value is increased as a color indicated by a lattice point of interest deviates from a specific color.

7. The lattice point determining method for correspondence definition data creation, according to Claim 2, wherein:

either or both of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function are functions which contain as variables color components constituting respective color spaces; and a deviation which is added to the color components of a lattice point when the evaluation functions are minimized in optimization with respect to the lattice point is calculated and the lattice point is repeatedly corrected by an amount equivalent to the deviation to enhance the evaluation of the smoothness of the disposition.

8. The lattice point determining method for correspondence definition data creation, according to Claim 2, wherein:

in readjustment of said ink quantity lattice points, binding conditions are imposed so that the ink quantity lattice points after readjustment will be transformed into said optimized low-dimensional color lattice points by a predetermined transformation expression for transforming ink quantity lattice points into lower-dimensional color lattice points, and thereby the ink quantity lattice points are determined.

9. A lattice point determining method for correspondence definition data creation whereby a plurality of lattice points which are referred to when correspondence definition data which defines correspondence between the ink quantities of inks in more than 3, CMY, colors used in a printing device and the color component values of various colors used in another image device are determined, the method comprising:

a step of defining both an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points whose components are said ink quantities of inks in various colors and a CMY lattice point smoothness evaluation function for evaluating the smoothness of the disposition of CMY lattice points defined by CMY color components;

a step of separately minimizing said ink quantity lattice point smoothness evaluation function and said CMY lattice point smoothness evaluation function;

a step of imposing binding conditions so that the ink quantity lattice points after readjustment will be transformed into CMY color lattice points determined by said minimization, by a predetermined transformation expression for transforming ink quantity lattice points into CMY lattice points;

a step of imposing limitation on ink quantity adhering to a printing medium as a binding condition when the ink quantity lattice points and the CMY lattice points are brought into correspondence with each other; and

a step of taking both the CMY lattice points determined by readjusting ink quantity lattice point positions and the ink quantity lattice points, as lattice points for correspondence definition data creation.

10. A lattice point determining method for correspondence definition data creation whereby a plurality of lattice points which are referred to when correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component values of various colors used in another image device is created are determined, the method comprising:

a step of defining both an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of disposition of ink quantity lattice points in an ink quantity space whose components are said color ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space defined by a smaller number of color components than the number of these inks;

a step of separately optimizing the ink quantity lattice points and the lower-dimensional color lattice points by separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function;

a step of maintaining either of the ink quantity lattice points

and the lower-dimensional color lattice points at optimized lattice points and readjusting the other optimized lattice points; and

a step of imposing limitation on ink quantity caused to adhere to a printing medium as a binding condition when a plurality of said lattice points are determined by said step of maintaining and readjusting, and carrying out said readjustment.

11. The lattice point determining method for correspondence definition data creation, according to Claim 10, wherein:

said readjustment is made by minimizing a first movement evaluation function containing a function whose value is increased with increase in the distance between the lattice points after readjustment and said other optimized lattice points.

12. The lattice point determining method for correspondence definition data creation, according to Claim 10, wherein:

said limitation on ink quantity is limitation on the maximum quantity of ink adhering to a specific printing area.

13. The lattice point determining method for correspondence definition data creation, according to Claim 12, wherein:

said maximum quantity of ink adhering is calculated by adding up the product of a weighting factor whose value is "0" or "1" defined for each ink quantity component value and each component value of said ink quantity lattice points.

14. The lattice point determining method for correspondence definition data creation, according to Claim 10, wherein:

said limitation on ink quantity is limitation on the quantity of a specific color ink consumed at a specific gradation value.

15. The lattice point determining method for correspondence definition data creation, according to Claim 14, wherein:

said limitation on the quantity of a specific color ink consumed is defined by a condition that the product of a weighting factor whose value is "0" or "1" defined for each ink quantity component value and each component value of said ink quantity lattice points is "0."

16. The lattice point determining method for correspondence definition data creation, according to Claim 11, wherein:

if there is not a solution which minimizes said first movement evaluation function when the positions of said either optimized lattice points in said readjustment, it is permitted to fluctuate the positions of said either optimized lattice points and said readjustment is made by minimizing a second movement evaluation function containing a function whose value is increased with increase in the distance between the lattice points after readjustment and said other optimized lattice points and further increased with increase in the moving distance of said either optimized lattice points.



17. The lattice point determining method for correspondence definition data creation, according to Claim 16, wherein:

in said second movement evaluation function, the unit fluctuation of said either optimized lattice points more greatly contributes to increase in the value of the second movement evaluation function than the unit fluctuation of said other optimized lattice points.

18. The lattice point determining method for correspondence definition data creation, according to Claim 16, wherein:

in said second movement evaluation function, the unit fluctuation of components having a small absolute value of said either optimized lattice points more greatly contributes to increase in the value of the second movement evaluation function than the unit fluctuation of components having a large absolute value in comparison.

19. An image processor which refers to correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component values of various colors used in another image device and generates print data for converting the color component values of various colors used in said image device into said ink quantities to cause print operation to be performed, wherein:

said correspondence definition data is data created by defining an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity

lattice points in an ink quantity space whose components are said ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space which is defined by a smaller number of color components than the number of these inks; separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function to separately optimize the ink quantity lattice points and the lower-dimensional color lattice points; keeping either of the ink quantity lattice points and the lower-dimensional color lattice points at optimized lattice points and readjusting the other optimized lattice points to determine a plurality of lattice points as lattice points for correspondence definition data creation; and bringing said ink quantities and the color component values of various colors used in said another image device into correspondence with each other by color measuring values obtained by subjecting the result of printing with ink quantities defined by the lattice points for correspondence definition data creation to color measuring with a predetermined color measuring instrument.

20. An image processing method wherein correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component values of various colors used in another image device

is referred to and thereby print data for converting the color component value of various colors used in said image device into said ink quantities to cause print operation to be performed is created, wherein:

said correspondence definition data is data created by defining an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points in an ink quantity space whose components are said ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space defined by a smaller number of color components than the number of these inks; separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function to separately optimize the ink quantity lattice points and the lower-dimensional color lattice points; keeping either of the ink quantity lattice points and the lower-dimensional color lattice points at optimized lattice points and readjusting the other optimized lattice points to determine a plurality of lattice points as lattice points for correspondence definition data creation; and bringing said ink quantities and the color component values of various colors used in said another image device into correspondence with each other by color measuring values obtained by subjecting the result of printing with ink quantities defined by the lattice points for

correspondence definition data creation to color measuring with a predetermined color measuring instrument.

21. A medium with an image processing program recorded thereon which program is for causing a computer to carry out a function of referring to correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component values of various colors used in another image device and creating print data for converting the color component values of various color used in said image device into said ink quantities to cause print operation to be performed, wherein:

said correspondence definition data is data created by defining an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points in an ink quantity space whose components are said ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space defined by a smaller number of color components than the number of these inks; separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function to separately optimize the ink quantity lattice points and the lower-dimensional color lattice points; keeping either of the ink quantity lattice points and the

lower-dimensional color lattice points at optimized lattice points and readjusting the other optimized lattice points to determine a plurality of lattice points as lattice points for correspondence definition data creation; and bringing said ink quantities and the color component values of various colors used in said another image device into correspondence with each other by color measuring values obtained by subjecting the result of printing with ink quantities defined by the lattice points for correspondence definition data creation to color measuring with a predetermined color measuring instrument.

22. An image processor which refers to correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component values of various colors used in another image device and creates print data for converting the color component values of various colors used in said image device into said ink quantities to cause print operation to be performed, wherein:

said correspondence definition data is data created by defining an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points in an ink quantity space whose components are said ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space defined by a smaller number of color components than

the number of these inks; separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function to separately optimize the ink quantity lattice points and the lower-dimensional color lattice points; keeping either of the ink quantity lattice points and the lower-dimensional color lattice points at optimized lattice points and readjusting the other optimized lattice points to determine a plurality of said lattice points; imposing limitation on ink quantities adhering to a printing medium as a binding condition in said readjustment to determine a plurality of the lattice points as lattice points for correspondence definition data creation; and bringing said ink quantities and the color component values of various colors used in said another image device into correspondence with each other by color measuring values obtained by subjecting the result of printing with ink quantities defined by the lattice points for correspondence definition data creation to color measuring with a predetermined color measuring instrument.

23. An image processing method wherein correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component values of various colors used in another image device is referred to and print data for converting the color component values of colors used in said image device into said ink quantities to cause print operation to be performed is created, wherein:

said correspondence definition data is data created by defining an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points in an ink quantity space whose components are said ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space defined by a smaller number of color components than the number of these inks; separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation functions and said lower-dimensional color lattice point smoothness evaluation function to separately optimize the ink quantity lattice points and the lower-dimensional color lattice points; keeping either of the ink quantity lattice points and the lower-dimensional color lattice points at optimized lattice points and readjusting the other optimized lattice points to determine a plurality of said lattice points; imposing limitation on ink quantities adhering to a printing medium as a binding condition in said readjustment to determine a plurality of the lattice points as lattice points for correspondence definition data creation; and bringing said ink quantities and the color component values of various colors used in said image device into correspondence with each other by color measuring values obtained by subjecting the result of printing with ink quantities defined by the lattice points for correspondence definition data creation to color measuring with a predetermined color measuring

instrument.

24. A medium with an image processing program recorded thereon which program is for causing a computer to carry out a function of referring to correspondence definition data which defines correspondence between the ink quantities of inks in various colors used in a printing device and the color component values of various colors used in another image device and creating print data for converting the color component values of various colors used in said image device into said ink quantities to cause print operation to be performed, wherein:

said correspondence definition data is data created by defining an ink quantity lattice point smoothness evaluation function for evaluating the smoothness of the disposition of ink quantity lattice points in an ink quantity space whose components are said ink quantities of inks in various colors and a lower-dimensional color lattice point smoothness evaluation function for evaluating the smoothness of the disposition of lower-dimensional color lattice points in a lower-dimensional color space defined by a smaller number of color components than the number of these inks; separately enhancing the evaluations of said ink quantity lattice point smoothness evaluation function and said lower-dimensional color lattice point smoothness evaluation function to separately optimize the ink quantity lattice points and the lower-dimensional color lattice points; keeping either of the ink quantity lattice points and the lower-dimensional color lattice points at optimized lattice



points and readjusting the other optimized lattice points to determine a plurality of lattice points; imposing limitation on ink quantities adhering to a printing medium as a binding condition in said readjustment to determine a plurality of the lattice points as lattice points for correspondence definition data creation; and bringing said ink quantities and the color component values of various colors used in said another image device into correspondence with each other by color measuring values obtained by subjecting the result of printing with ink quantities defined by the lattice points for correspondence definition data creation to color measuring with a predetermined color measuring instrument.